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(71) Applicant *(for all designated States except US)*: **DELLE VEDOVE LEVIGATRICI SPA** [IT/IT]; Viale Treviso, 13/A, I-33170 Pordenone (IT).

(72) Inventor; and

(75) Inventor/Applicant *(for US only)*: **DELLE VEDOVE, Gaetano** [IT/IT]; Piazzetta Ottoboni, 4, I-33170 Pordenone (IT).

(74) Agents: **PETRAZ, Gilberto** et al.; GLP Srl, Piazzale Cavedalis, 6/2, I-33100 Udine (IT).

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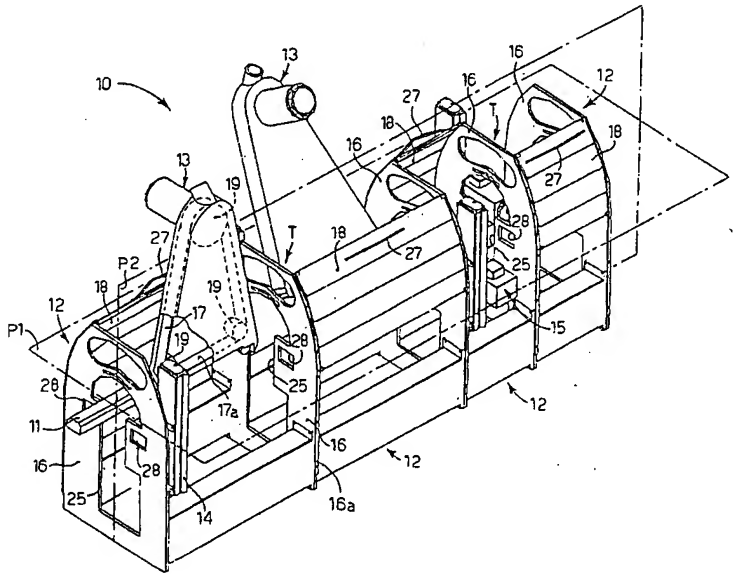
(54) Title: MACHINE FOR FINISHING AN OBJECT SUCH AS A PROFILED ELEMENT, A PANEL, OR SUCHLIKE



(57) Abstract: Machine (10) for finishing an object (11) comprising feed members (20, 120, 220, 320, 420) to feed the object (11) along a reference plane (P1), and at least a work station (13, 15) provided with a tool (17) which contacts the object (11) in a work zone (Z) near the reference plane (P1). The machine (10) comprises two lateral supporting walls (16) arranged substantially orthogonal both to the reference plane (P1) and also to the median plane (P2), which support the work station (13, 15) laterally, in order to define with the latter a modular structure (12) able to be selectively associated with other modular structures (12) along the direction of feed of the object (11).

WO 2005/110677 A1

"MACHINE FOR FINISHING AN OBJECT SUCH AS A PROFILED ELEMENT, A PANEL, OR SUCHLIKE"

* * * * *

FIELD OF THE INVENTION

The present invention concerns a machine for finishing an object such as a profiled element, a panel, or suchlike, made of any material such as wood, metal, plastic or other. To be more exact, the machine according to the invention comprises a plurality of work stations arranged in line, which can be, for example, for smoothing, painting, cutting, covering or other operations.

BACKGROUND OF THE INVENTION

A machine is known for finishing an object, such as a wooden profiled element, or suchlike, which comprises feed means to feed the object to be finished along a reference plane.

The machine also comprises one or more work stations mounted in line on the base, along the reference plane, at a determinate distance from each other, in order to finish longitudinally the outer surfaces of the object.

Generally, part of the work stations is able to smooth the outer surfaces of the object, and comprises a supporting frame, or operative assembly, inside which an abrasive belt is arranged or one or more abrasive grinding wheels driven by relative motors.

Each supporting frame, or operative assembly, can be oriented, as desired, according to the position of the surface of the object on which the abrasive belt has to exert its smoothing action. To be more exact, the supporting frame, or operative assembly, can be positioned as desired between a first operating position substantially vertical with respect to the reference plane, and a second operating position inclined with respect to the first

operating position by an angle of less than 180°.

To ensure that all the outer surfaces of the object are smoothed, the abrasive belts are able to contact alternately the upper, lower, left and right surfaces of the object. In this way, the relative supporting frames are thus arranged alternately above, below, left and right with respect to the base.

This alternated arrangement of the supporting frames however, entails a lateral bulk that is irregular with respect to the base, causing problems of safety, in order to limit the risk of accidents.

It is therefore difficult to guarantee the safety of the workers, especially to prevent them from accessing the zone where the abrasive belt, or abrasive grinding wheel, contacts the object, and to prevent the accidental escape from said zone of chip or other waste materials.

It is also difficult to guarantee the safety of the workers, to prevent their access to the zone where the objects pass from one work station to another, guided by profiles with guide wheels and pressed on the feed means by other pressure wheels.

The other work stations provided on finishing machines are chosen each time according to the type of finishing that has to be performed on the object and are, for example, painting, covering, cutting stations, etc.

On the one hand, this choice allows wide flexibility in setting up the machine, but on the other hand it entails, on each occasion, a specific design of the base according to the type of work stations that have to be mounted, with a consequent increase in production times and costs, and also in the management of the spare parts in store.

Another disadvantage is that, on each occasion, specific connection members have to be provided, which allow the

various feed means to be mounted on the base.

One purpose of the present invention is to achieve a finishing machine for a profiled element, a panel or suchlike, which will prevent an operator from directly accessing the zone where the tools of the various work stations are in action, or the adjacent transport zones where the object passes from one work station to another, and prevent waste materials or other elements present, from escaping accidentally from said zones.

Another purpose of the present invention is to achieve a finishing machine which does not require, on each occasion, a specific design of the components, according to the finishing operations to be performed, or the type of object to be worked.

Another purpose of the present invention is to achieve a finishing machine which can provide any type of feed means for the objects, without requiring specific connection members on each occasion.

Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

The present invention is set forth and characterized in the main claim, while the dependent claims describe other characteristics of the present invention or variants to the main inventive idea.

In accordance with the above purposes, a machine according to the present invention for finishing an object comprises feed means to feed the object along a reference plane, and at least a work station provided with at least a tool, which is able to contact the object in a work zone, near the reference plane, following the profile thereof.

The work station is able to be positioned in a desired

plurality of work positions comprised between a first position, wherein it lies on a median plane substantially perpendicular to the reference plane, and a second position, wherein it is substantially inclined by an angle of less than 180° with respect to the first position, thus defining a circular work sector.

According to a characteristic feature of the present invention, the machine comprises two lateral supporting walls, arranged transverse both to the reference plane and also to the median plane, distanced from each other and able to support the work station laterally, so as to define with the latter a modular structure able to be selectively associated with other, similar modular structures, along the direction of feed of the object.

In this way, it is therefore possible to achieve a complex finishing machine simply by combining together in line a plurality of modular structures.

Moreover, the modular nature of the machine according to the present invention allows to reduce to a minimum the costs and times of preparation and assembly, and also the costs of managing the spare parts in the store and of maintenance.

According to a variant, the machine also comprises a protection element arranged on the side opposite the circular work sector, with respect to the median plane, and able to cover at least temporarily and partly the work zone and the transit or transport zone where the object is transported, by the feed means, from one work station to the other.

In this way, an operator is prevented from directly accessing the transport zone and the work zone, thus limiting the risk of accidents. Moreover, the protection element prevents the waste materials, or other elements

present inside the work zone, from accidentally escaping therefrom.

According to another variant, the protection element is mounted able to be positioned with respect to the lateral supporting walls; it can thus be positioned between a position of protection, wherein it prevents access to the work zone and the transport zone, and an equipping position, wherein it allows access to the work zone and the transport zone.

According to another variant, the two lateral supporting walls comprise coordinated through apertures, able to allow the feed means to be positioned inside them.

BRIEF DESCRIPTION OF THE DRAWINGS

These and other characteristics of the present invention will become apparent from the following description of a preferential form of embodiment, given as a non-restrictive example, with reference to the attached drawings wherein:

- fig. 1 is a schematic three-dimensional view of a machine for finishing an object according to the present invention;
- fig. 2 is a schematic side view of the machine in fig. 1;
- fig. 3 shows a first variant of fig. 2;
- fig. 4 shows a second variant of fig. 2;
- fig. 5 is a schematic view of a first type of feed means able to be associated with the machine in fig. 1;
- fig. 6 is a schematic view of a second type of feed means able to be associated with the machine in fig. 1;
- fig. 7 is a schematic view of a third type of feed means able to be associated with the machine in fig. 1;
- fig. 8 is a schematic view of a fourth type of feed means able be associated with the machine in fig. 1;
- fig. 9 is a schematic view of a fifth type of feed means

able to be associated with the machine in fig. 1.

DETAILED DESCRIPTION OF A PREFERENTIAL FORM OF EMBODIMENT

With reference to fig. 1, a machine 10 for finishing an object 11 according to the present invention in this case consists substantially of four modules 12 arranged in line, each one comprising a specific work station.

In this case, the first two modules 12 comprise respective work stations provided with belt-type smoothing machines 13, while the last two modules 12 comprise work stations provided with further finishing members 15, not shown in detail and of a substantially known type, such as for example smoothing members with grinding wheels, painting members, cutting members, covering members or other.

For simplicity of description, the object 11 finished by the machine 10 according to the invention will be indicated hereafter as a profiled element 11, but this does not excludes that the object may be for example a lath of a frame, a panel or suchlike, made of any material whatsoever, like wood, metal, plastic or other.

The machine 10 according to the invention also comprises a feed member, specifically shown in some of its variant embodiments in figs. 5, 6, 7, 8 and 9, and indicated respectively by the reference numbers 20, 120, 220, 320 and 420. The feed member 20, 120, 220, 320 and 420 is able to automatically feed the profiled element 11 through the various modules 12 along a reference plane P1, in this case, substantially horizontal.

Each module 12 (figs. 1, 2, 3 and 4) comprises two lateral supporting walls 16, substantially vertical, parallel with each other and substantially orthogonal to the reference plane P1, which are able to support laterally the respective belt-type smoothing machine 13, or other

work station 15.

The belt-type smoothing machine 13 is arranged above the reference plane P1 and is of the type provided with at least an abrasive belt 17 wound annularly around three pulleys 19, of which one is motorized, so that at least one segment 17a thereof is substantially tensed and rectilinear, so as to be arranged in contact with an outer surface of the profiled element 11 in a work zone Z, near the reference plane P1, and thus perform the smoothing operation.

The belt-type smoothing machine 13 can also be rotated into a plurality of work positions comprised between a first position wherein it lies on a median plane P2 substantially perpendicular to the reference plane P1, and a second position wherein it is substantially inclined, in this case, by an angle of a little over 90°, with respect to its first position, thus defining a circular work sector S, substantially opposite the work zone Z, with respect to the median plane P2.

To be more exact, the belt-type smoothing machine 13 is pivoted on a positioning column 14 mounted on the inner part of one or of both the lateral supporting walls 16.

Moreover, the lateral supporting walls 16 each have a circular eyelet 21 able to allow the positioning, also angled as desired, of a pressure member, not shown in the drawings, able to guide and keep the profiled element 11 in a desired reference position during the working steps.

According to a variant not shown here, the eyelet 21 can be rectilinear, or can have any other development, according to the type of profiled element 11 to be worked, or the type of work to be done.

Each lateral supporting wall 16 also has two positioning holes 28, able to house inside them specific guide means,

of a substantially known type and not shown here, to keep the profiled element 11 guided laterally in a transport zone T, wherein the latter is transported from one module 12 to another. The guide means can be for example: guide bars, squares, sliders with wheels or other.

According to the present invention, the machine 10 also comprises a protection element 18, 118, 218, with a shape mating at least with the upper part of the profile of the lateral supporting walls 16, and arranged in connection with the latter on the side opposite the circular sector S with respect to the median plane P2, so as to substantially cover the work zone Z and the transport zone T, at least during the operative steps of the machine 10.

In the embodiment shown in fig. 2, the protection element 18 is advantageously mounted sliding with respect to the two lateral supporting walls 16, so that it can be selectively positioned between a protection position, shown in a continuous line in fig. 1, wherein it prevents access to the work zone Z and the transport zone T, and an equipping position, wherein it allows access to said work zone Z and transport zone T, for example to perform equipping operations or maintenance or other.

The sliding assembly of the protection element 18 is achieved by means of a pair of sliding wheels 26 (fig. 2) mounted rotatable thereon, on the lower part of its lateral edges 18a, and able to slide inside mating sliding guides 23, made on the inner surface of each lateral supporting wall 16, or the surface facing towards the belt-type smoothing machine 13, or the other work station 15. To be more exact, each sliding guide 23 is made in proximity with one edge 16a of the respective lateral supporting wall 16, opposite the circular work sector S.

Moreover, the protection element 18 comprises, on the

outer side, a gripping handle 27 connected laterally to two bars 29, of which only one is visible in the figures, arranged through the protection element 18 and pivoted, on the inner side of the latter, to a guide lever 30, which is in turn pivoted to the lateral supporting walls 16.

In this way, as shown by the line of dashes in fig. 2, starting from the protection position, a manual traction of the gripping handle 27 in the direction of the arrow 31 entails the passage of the protection element 18 to its equipping position.

According to the embodiment shown in fig. 3, the protection element, indicated by the reference number 118, consists of a plurality of sections 32 articulated to each other and able to slide inside the sliding guides 23, so that by acting in the direction of the arrow 33, the protection element 118 slides from its protection position, shown in a continuous line, to its equipping position, shown by a line of dashes.

In the embodiment shown in fig. 4, the protection element 218 consists of two doors 51, shown here in their equipping position, which are individually and selectively able to be opened by means of the handles 27, in order to allow access to the work zone Z and the transport zone T. In this embodiment the lateral supporting walls 16 have a square shape in the upper part, so as to simplify the positioning and construction of the doors 51.

In all the embodiments described above, the work zone Z and the transport zone T are in any case selectively isolated and, in practice, access to said work zone Z and transport zone T for the operator is prevented, at least during the operating steps of the machine 10. Moreover, this isolation prevents waste materials or other remnants from escaping from said work zone Z, and possibly from the

transport zone T, and accidentally hitting the operator or other adjacent structures.

Advantageously, safety sensors are associated with the sliding guides 23, in those embodiments where they are provided; the safety sensors are able to prevent the functioning of the whole machine 10 when at least one of the protection elements is not in its protection position.

Each of the two lateral supporting walls 16 also comprises a lightening hole 24 and a through aperture 25, the latter for positioning the respective feed member 20, 120, 220, 320, 420.

The lightening hole 24 is made through in the upper part of every lateral supporting wall 16 and can also be used to allow the positioning of pressure and/or inspection members, of a known type, which allow the piece to be pressed and/or the work done in the work zone Z and the transport zone T to be controlled.

The through aperture 25, on the contrary, has a shaping such as to allow to insert inside every module 12 any feed member 20, 120, 220, 320 or 420. In the case shown in figs. 2, 3 and 4, the feed member indicated by the number 220 is inserted. In this case it is not necessary to provide, on each occasion, specific connection elements, and there is no risk of the structure of each lateral supporting wall 16 becoming excessively weakened. To be more exact, the through aperture 25 has a lower zone 25a able, for example, to allow the insertion of the various motors of the feed members 20, 120, 220, 320, 420, whatever their shape or size may be, an intermediate zone 25b able to allow the insertion of the supports for the feed members 20, 120, 220, 320, 420, and an upper zone 25c able to allow the housing of the various belts or rollers that determine the guide and advance of the profiled element 11.

In the embodiment shown in fig. 5, the feed member 20 consists of a track 35, arranged annularly around two pulleys 36, of which one is motorized by means of an electric motor 37, and provided on the outside with a plurality of pads 39 able to contact the lower surface of the profiled element 11 in order to make it advance through the modules 12, along the reference plane P1.

In the embodiment shown in fig. 6, the feed member 120 comprises a plurality of rollers 40, connected to each other and moved by means of a plurality of transmission members 41, in turn connected kinematically with a motor member, not shown here. In this embodiment the profiled element 11 is positioned above the rollers 40, so that the rotation of the latter determines its advance through the modules 12, along the reference plane P1.

Fig. 7 shows a third type of feed member 220, in this case comprising five conveyor belts 42, motorized in a known manner by means of a single motor member 43, arranged in correspondence with the various transport zones T and supported by relative supports 44 arranged in correspondence with the intermediate zone 25b of the through aperture 25. In alternation with the conveyor belts 42 four conveyor belts 45 are arranged. The latter are positioned in correspondence with the work zones Z of every module 12. According to a variant of this embodiment, the conveyor belts 42 and 45 can be arranged offset with respect to each other.

In the embodiment shown in fig. 8, the feed member 320 comprises a chain 46 wound around two crowns 47, of which one is motorized by means of a motor member of a substantially known type, and provided on the outside at regular intervals with a plurality of blocks 50 able to thrust the profiled element 11 from the rear along the

reference plane P1.

In the embodiment shown in fig. 9, the feed member 420 consists of three tracks 52, substantially half the thickness with respect to the track 35 of the feed member 20, arranged in succession and at least partly superimposed in correspondence with the segments wherein they are wound on the respective pulleys 53. At least one of the pulleys 53 is motorized by means of an electric motor 54, and every track 52 is provided on the outside with a plurality of pads 55 able to contact the lower surface of the profiled element 11 in order to feed it through the modules 12, along the reference plane P1.

According to a variant, every track 52 can be replaced by a belt, or any other similar or comparable transport element.

It is clear, however, that modifications and/or additions of parts may be made to the machine 10 as described heretofore, without departing from the field and scope of the present invention.

It is also clear that, although the present invention has been described with reference to specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of machine for finishing an object such as a profiled element, a panel or suchlike, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

CLAIMS

1. Machine for finishing an object (11) comprising feed means (20, 120, 220, 320, 420) to feed said object (11) along a reference plane (P1), and at least a work station (13, 15) provided with at least a tool (17) which is able to contact said object (11) in a work zone (Z) near said reference plane (P1), characterized in that it comprises two lateral supporting walls (16) arranged substantially orthogonal both to said reference plane (P1) and also to a median plane (P2), substantially perpendicular to said reference plane (P1), and able to support said work station (13, 15) laterally, in order to define with said work station (13, 15) a modular structure (12) able to be selectively associated with other modular structures (12) along the direction of feed of said object (11).

2. Machine as in claim 1, wherein said work station (13) is able to be positioned in a plurality of work positions comprised between a first position wherein said work station (13) lies substantially on said median plane (P2), and a second position wherein said work station (13) is substantially inclined by an angle of less than 180° with respect to said first position, so that said plurality of work positions defines a circular work sector (S), characterized in that a protection element (18, 118, 218) is able to at least temporarily cover said work zone (Z) and is arranged on the side opposite said circular work sector (S) with respect to said median plane (P2).

3. Machine as in claim 2, characterized in that said protection element (18, 118, 218) extends laterally in order to cover at least a transit zone (T) adjacent to said work zone (Z).

4. Machine as in claim 2 or 3, characterized in that said protection element (18, 118, 218) is able to be positioned

with respect to said lateral supporting walls (16) between a protection position wherein said protection element (18, 118, 218) prevents access to said work zone (Z) or to said transit zone (T), and an equipping position wherein said protection element (18, 118, 218) allows access to said work zone (Z) or to said transit zone (T).

5. Machine as in claim 4, characterized in that each of said two lateral supporting walls (16) comprises a sliding guide (23) facing towards said work station (13, 15) and inside which respective sliding means (26, 32) of said protection element (18, 118) are able to slide, in order to allow said protection element (18, 118) to be positioned between said protection position and said equipping position.

6. Machine as in claim 5, characterized in that said sliding means comprise a pair of rotatable sliding wheels (26) mounted laterally to said protection element (18) and able to slide inside said sliding guides (23), and in that said protection element (18) comprises, on the outer side, a gripping member (27) connected laterally to at least a bar (29) through with respect to said protection element (18) and pivoted, on the inner side of said protection element (18), to a guide lever (30), which is in turn pivoted on the lateral supporting walls (16).

7. Machine as in claim 5, characterized in that said protection element (118) comprises a plurality of sections (32) pivoted to each other and able to slide inside said sliding guides (23).

8. Machine as in claim 4, characterized in that said protection element (218) comprises at least a door (51) pivoted to at least one of said two lateral supporting walls (16).

9. Machine as in claim 1, characterized in that each of

said two lateral supporting walls (16) comprises a through aperture (25) arranged facing and coaxial with a similar through aperture (25) made on the other lateral supporting wall (16), and shaped so as to allow the positioning inside it of said feed means (20, 120, 220, 320, 420), irrespective of the conformation of said feed means (20, 120, 220, 320, 420).

10. Machine as in claim 1, characterized in that each of said two lateral supporting walls (16) has an eyelet (21), able to allow the positioning of a pressure member able to guide and keep said object (11) in a desired reference position during the working steps.

11. Machine as in claim 1, characterized in that each of said two lateral supporting walls (16) has a plurality of positioning holes (28), able to allow the positioning of lateral or directable guide members able to keep said object (11) in a desired reference position during the working steps.

12. Machine as in any claim hereinbefore, characterized in that said feed means (20) comprise a track (35), arranged annularly around two pulleys (36), of which one is motorized by means of a motor member (37), and provided on the outside with a plurality of pads (39) able to contact a lower surface of said object (11) in order to make it advance along said reference plane (P1).

13. Machine as in any claim from 1 to 9 inclusive, characterized in that said feed means (120) comprises a plurality of rollers (40), connected to each other and moved by means of a plurality of transmission members (41), in turn connected kinematically with a common motor member, and able to contact a lower surface of said object (11) in order to make it advance along said reference plane (P1).

14. Machine as in any claim from 1 to 9 inclusive,

characterized in that said feed means (220) comprise a plurality of first motorized conveyor belts (42), arranged in alternation with a plurality of second idle conveyor belts (45), said first conveyor belts (42) and said second conveyor belts (45) being able to contact a lower surface of said object (11) in order to make it advance along said reference plane (P1).

15. Machine as in any claim from 1 to 9 inclusive, characterized in that said feed means (320) comprise a chain (46) wound around a plurality of crowns (47), of which one is motorized by means of a motor member, and provided on the outside at regular intervals with a plurality of blocks (50) able to thrust said object (11) from the rear in order to make it advance along said reference plane (P1).

16. Machine as in any claim from 1 to 9 inclusive, characterized in that said feed means (420) comprise a plurality of tracks (52) wound annularly on respective pulleys (53) and arranged in succession and at least partly superimposed in correspondence with the segments wherein they are wound on said pulleys (53), at least one of said pulleys (53) being motorized by means of a motor member (54).

17. Machine as in claim 16, characterized in that each of said tracks (52) is provided on the outside with a plurality of pads (55) able to contact the lower surface of said object (11) in order to make it advance along said reference plane (P1).

18. Machine as in any claim hereinbefore, characterized in that said work station comprises a belt-type smoothing machine (13) provided with at least an abrasive belt (17) wound around a plurality of pulleys (19) so that at least one segment (17a) thereof is substantially tensed and

rectilinear, to be arranged in contact with said object (11) in said work zone (Z).

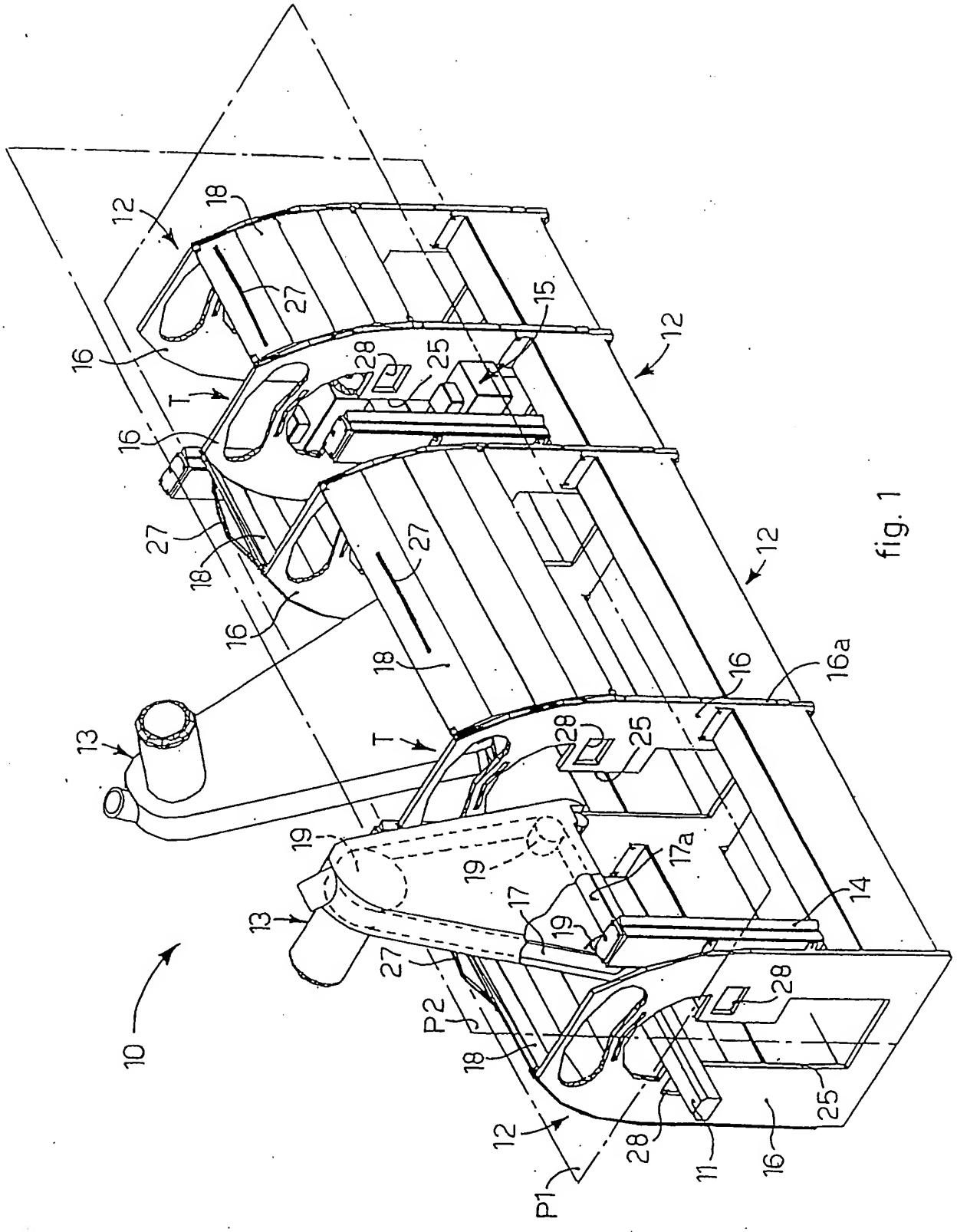
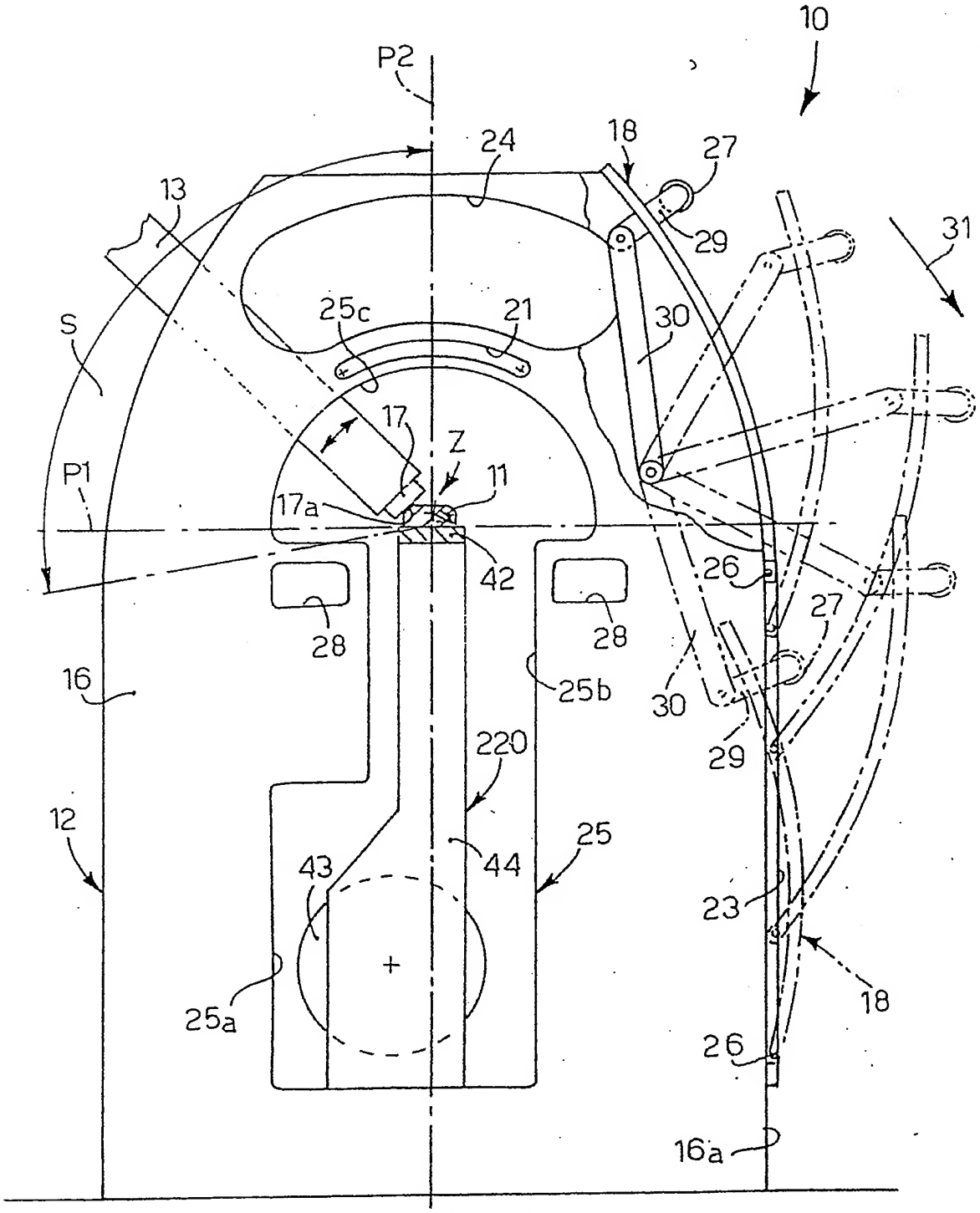


fig. 1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25b
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220
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25a
26
16a

fig. 2

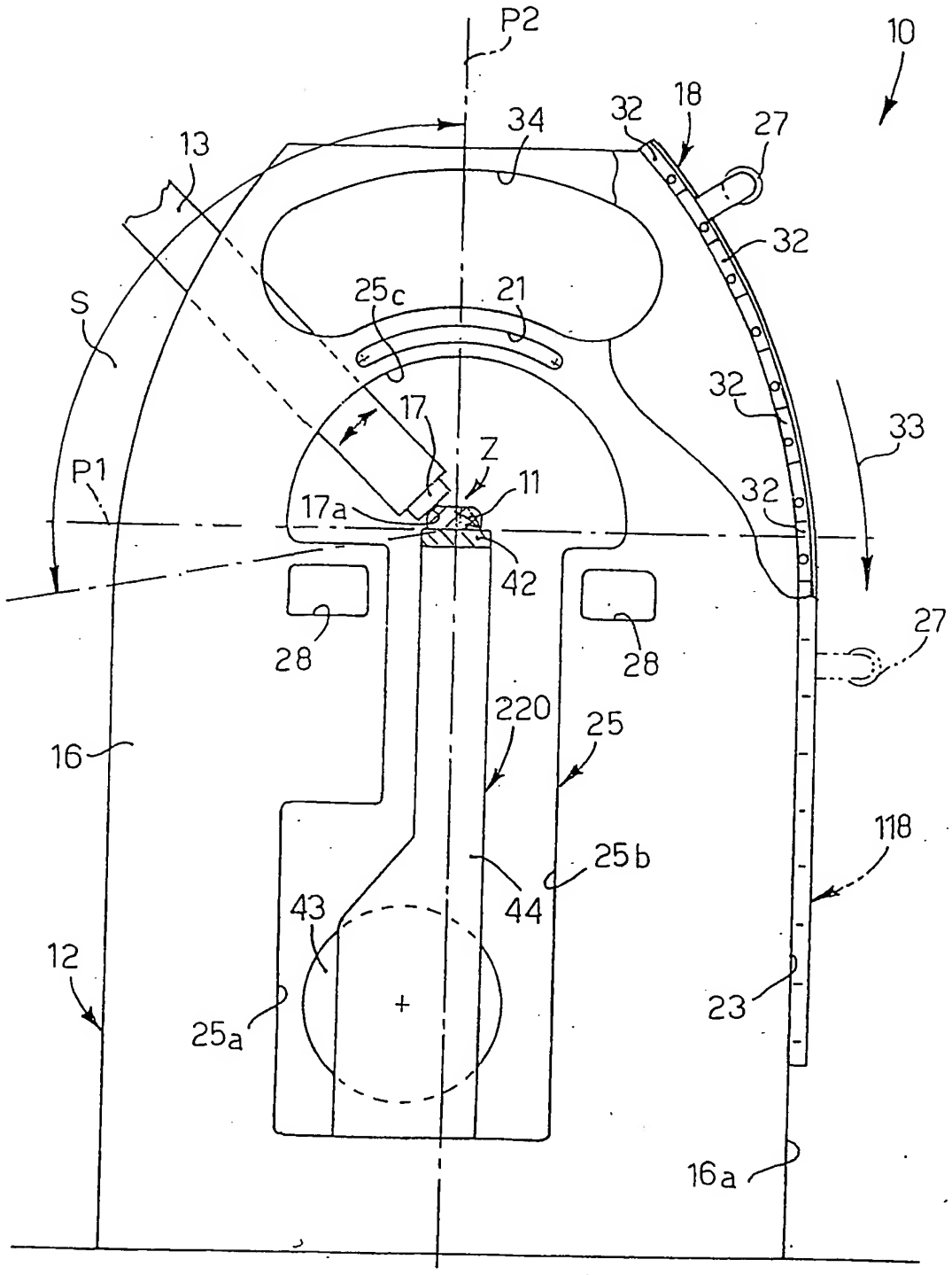
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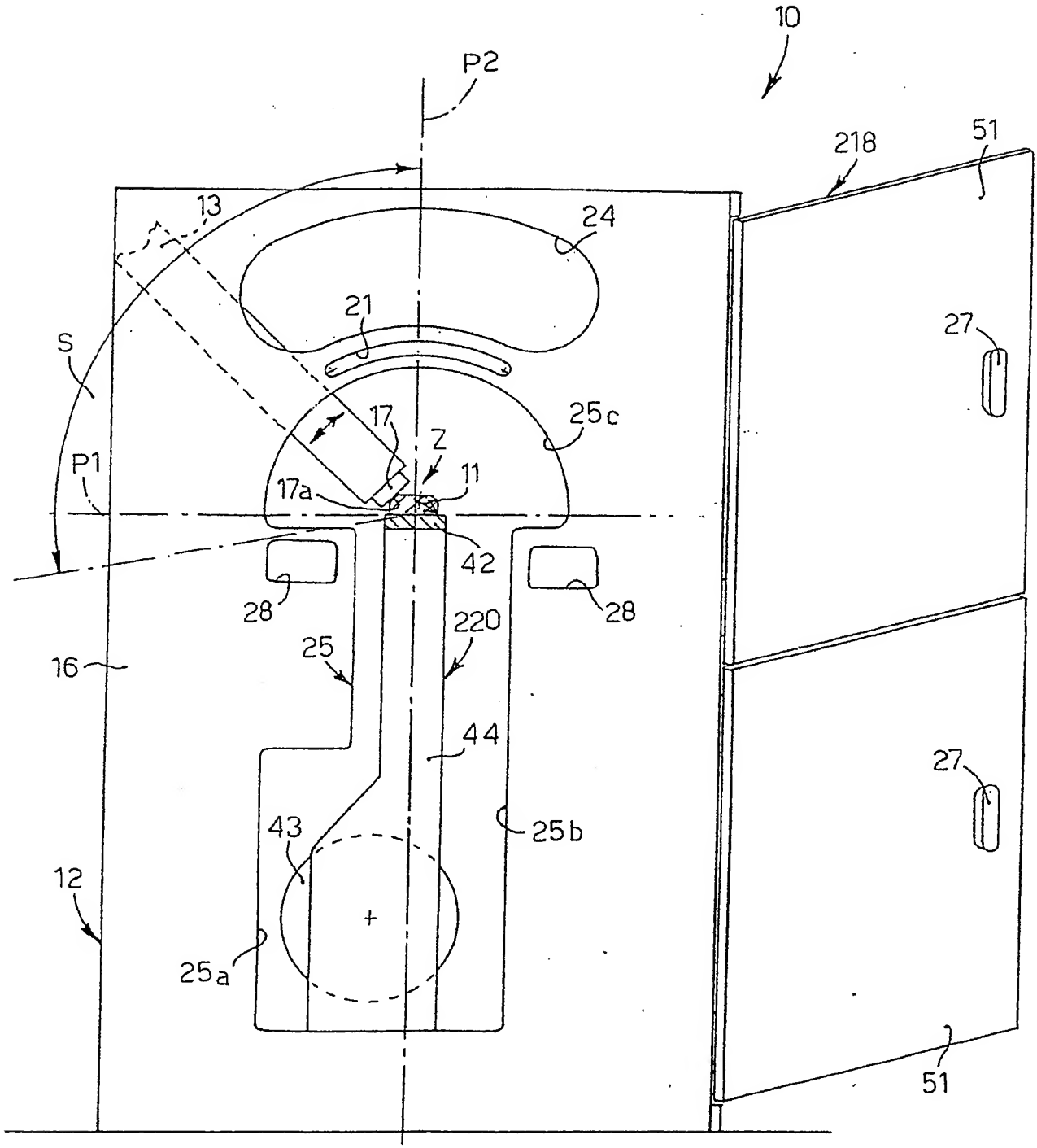
fig. 3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43
25b
12
25a
51

fig. 4

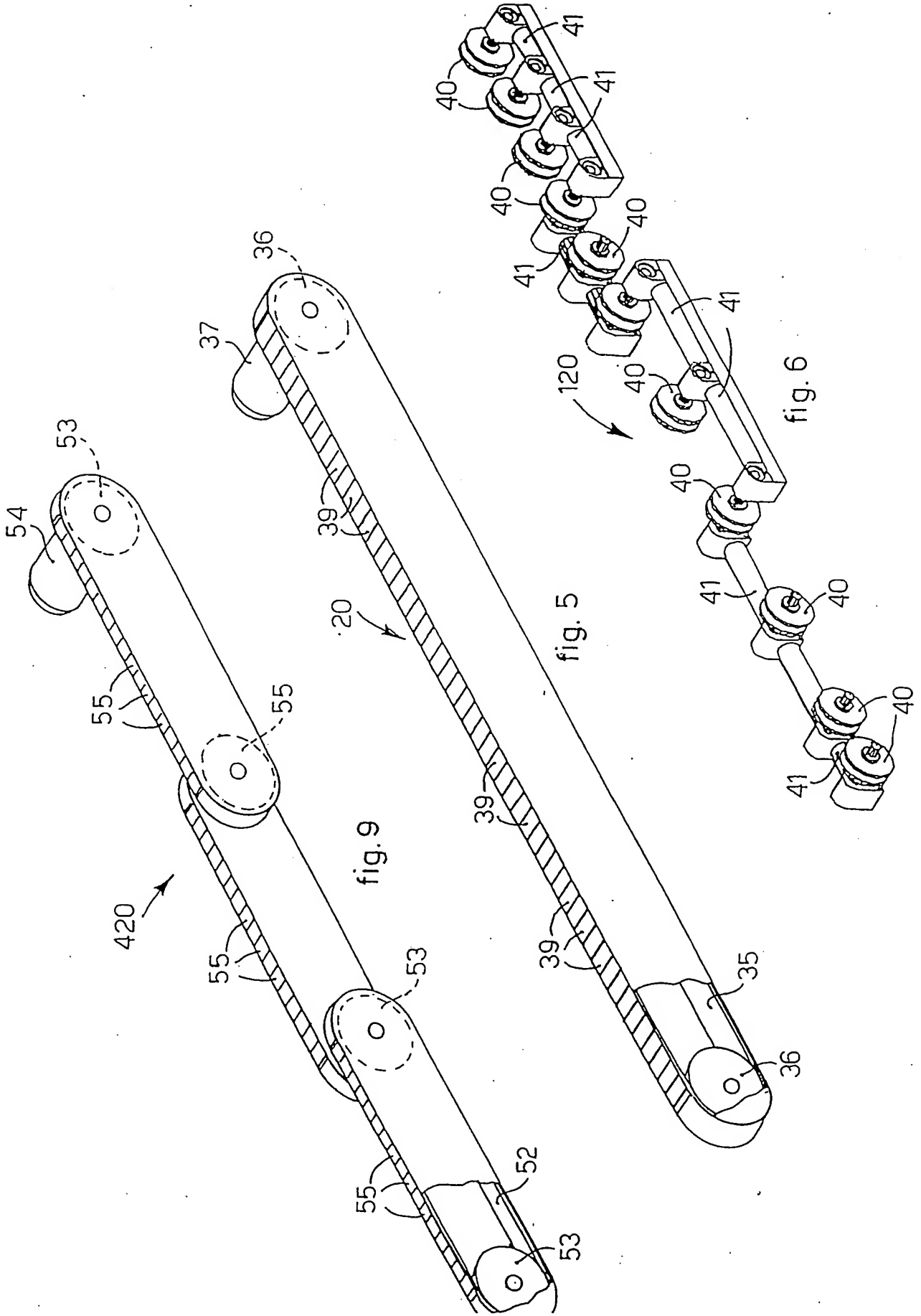

fig. 6

fig. 5

fig. 9

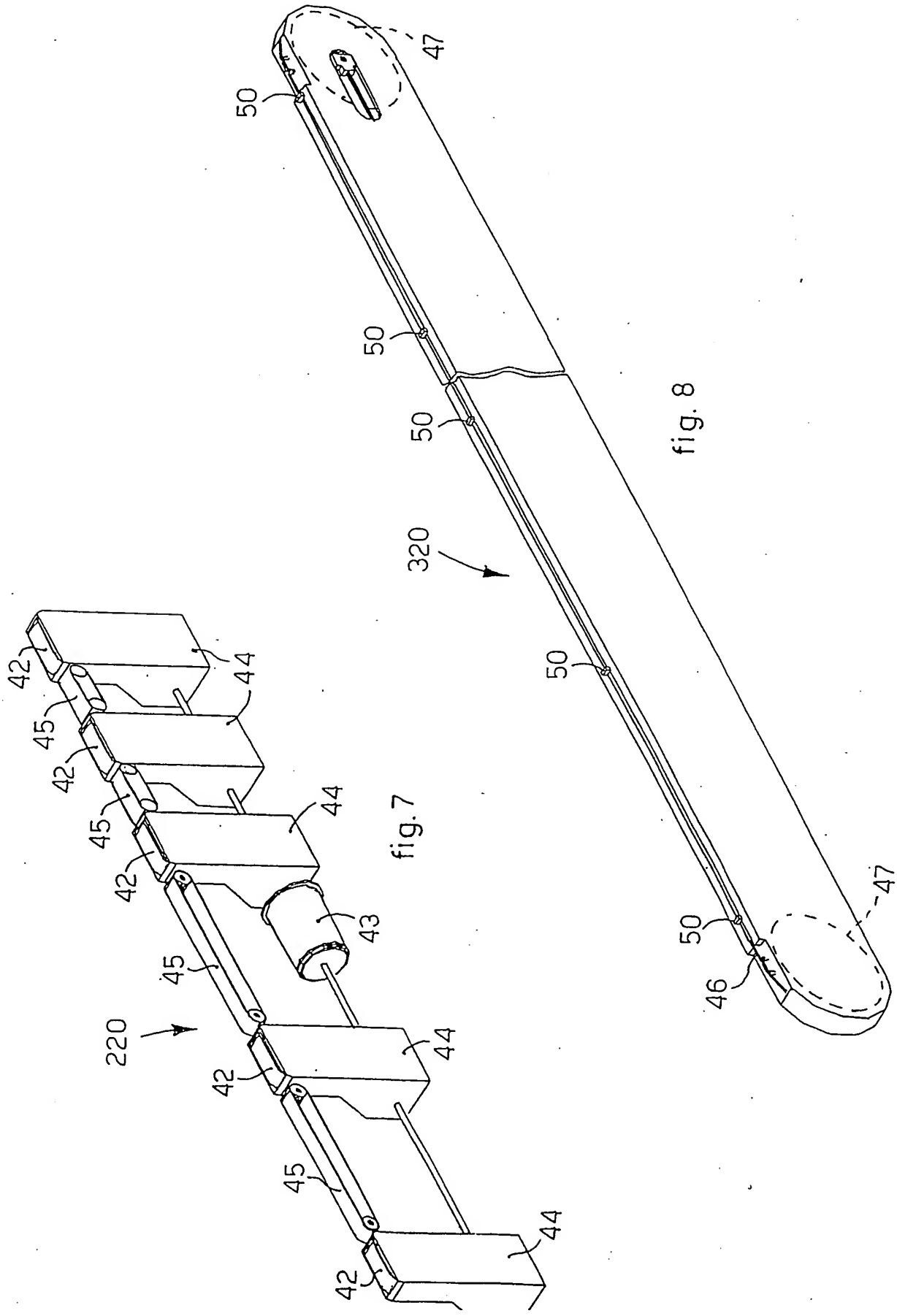
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fig. 8

fig. 7

INTERNATIONAL SEARCH REPORT

International Application No
PCT/IB2004/003215

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B24B21/04 B24B7/28 B24B55/04 B23Q7/14 B23Q11/08
B27C1/02 B05B13/02 B05C9/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B24B B23Q B27C B05B B05C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 199 20 950 A1 (IMA MASCHINENFABRIKEN KLESSMANN GMBH) 16 November 2000 (2000-11-16) the whole document	1-4,8-18
A	WO 03/099461 A (DELLE VEDOVE LEVIGATRICI SPA; DELLE VEDOVE, GAETANO) 4 December 2003 (2003-12-04) page 4, line 26 - page 9, line 32; figures	1-18

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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'&' document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
8 February 2005	15/02/2005

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Gelder, K

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/IB2004/003215

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19920950 A1	16-11-2000	NONE	
WO 03099461 A	04-12-2003	IT UD20020110 A1	24-11-2003
		WO 03099461 A1	04-12-2003